Will Wind Energy Work for Me?

A Guide to Distributed Wind for Kentucky and Tennessee Residents, Businesses, and Organizations

2011
Prepared by the Tennessee Valley and Eastern Kentucky Wind Working Group

Primary Author
Katie Stokes, Southern Alliance for Clean Energy

Editor
Simon Mahan, Southern Alliance for Clean Energy

Contributors
Rick Carson, Tennessee Valley Authority
Gil Melear-Hough, Restoration Services, Inc.
Fernie Williams, East Kentucky Power Cooperative

1. Introduction to Distributed Wind

Distributed generation is a method of generating electricity from multiple small energy sources near to where the electricity is actually used.

Residents, businesses, and organizations have the opportunity to generate their own electricity from the wind.

Kinetic energy from the wind turns a wind turbine's blades, converting the energy into mechanical power to run a generator. Wind turbines come in several sizes. Typically, the larger the swept-area of the turbine's blades, the more energy the turbine will be able to collect from the wind.

Wind turbines are labeled as "small", "medium", or "large".

"Small wind" refers to wind turbines rated from 400 watts to 100 kilowatts (kW, 100,000 watts) when running at full capacity. Small wind turbines are ideal to help power homes, farms, or small businesses.

Energy Efficiency

Those looking to reduce their energy bill should first look to work towards energy efficiency in their homes or businesses. There are several ways to make your home or business more efficient such as proper insulation, weatherization, and upgrading to efficient heating and cooling systems. Reducing your energy consumption can also reduce the size of the renewable energy system you need.

If you live in the TVA service territory, you can schedule a home energy evaluation through TVA's Energy Right program. Find out more at www.energyright.com.

Medium-scale turbines have a capacity greater than 100 kilowatts or less than 1 megawatt (MW, 1,000 kilowatts). This size is most typical for large businesses or communities.

Utilities or wind energy development companies use multiple large wind turbines to create a "wind farm". Wind farms can have the capacity to generate hundreds of megawatts of electricity. Each large turbine has a capacity of 1MW or greater.

The amount of electricity you can generate depends on your wind resource, the size of turbine you choose, and how the turbine is sited. The electricity generation and policies for wind power in your area will determine whether a wind energy system will be economical.

This guide is intended to provide the information needed to help make an educated decision if wind power will be right for your individual needs. It will cover how to identify your wind resource, turbine siting best practices, and how to calculate a return of investment.

2. Identify Your Wind Resource

Small wind electric systems work best in areas with annual average wind speeds above 10 miles per hour (4.5 m/s) at the height of the wind turbine's hub, or an NREL Class 2 power density.

Wind is too turbulent in urban areas to make a wind turbine economical, reliable, or safe. In cities, solar energy is a much better renewable energy option for homes or offices. Unless a building is specifically designed to handle the additional weight and load of a wind turbine, do not assume a wind turbine can be attached to a roof.

Wind Maps

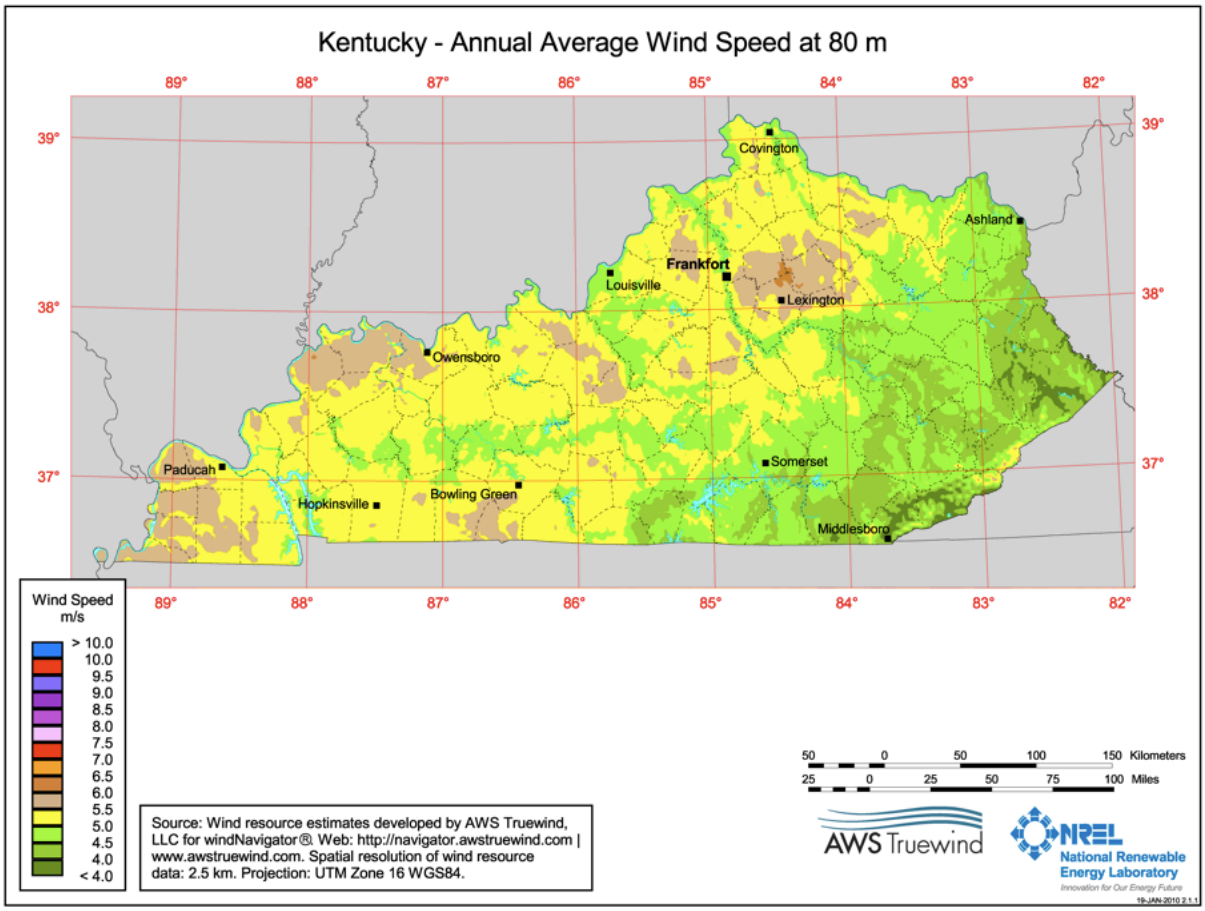
The National Renewable Energy Lab provides wind maps for each state available for download at the Department of Energy's Wind Powering America initiative website: www.windpoweringamerica.gov.

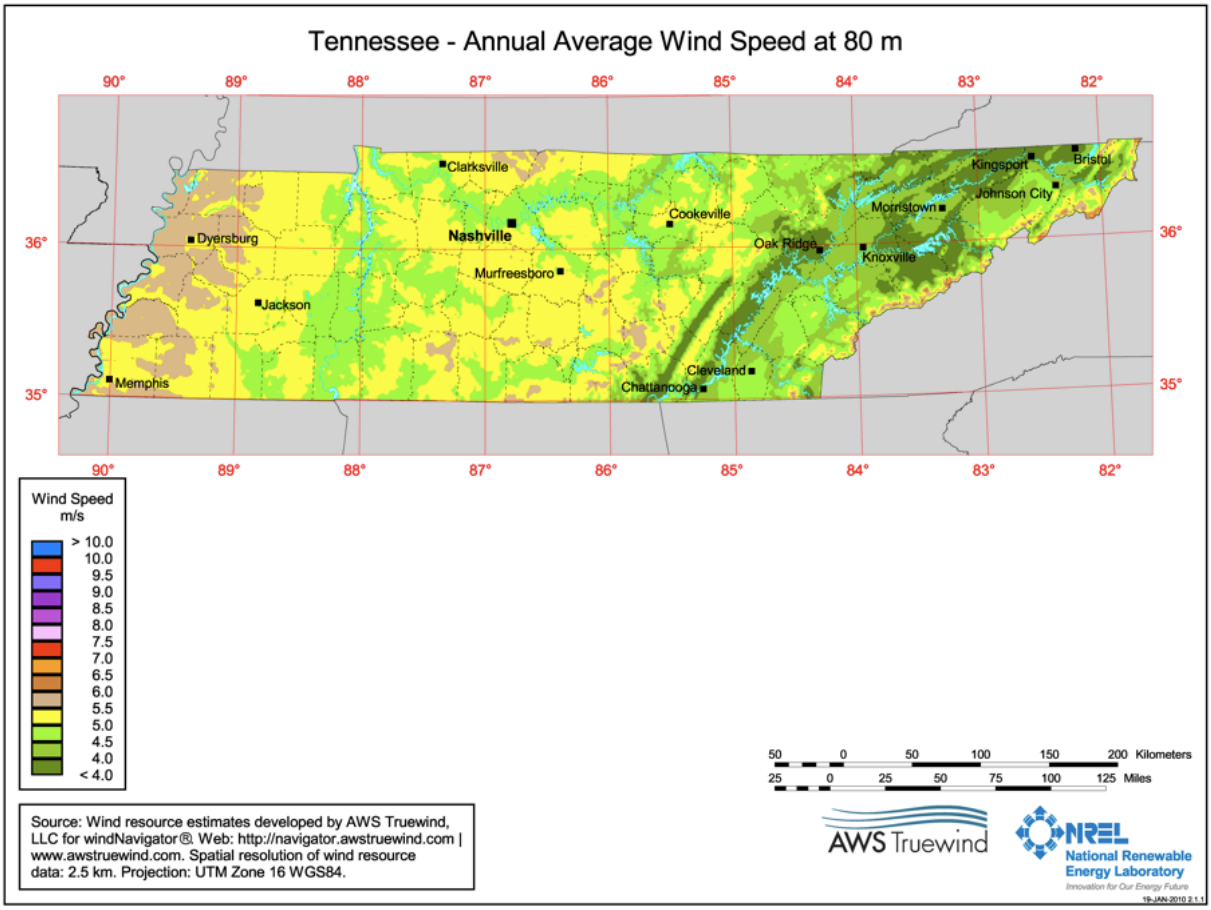
Not all wind resource maps are the same. The following pages show our two states with two versions of wind maps. There are several important differences:

Spatial resolution: The smaller the spatial resolution, the better it will be to identify ridge-top wind. Large spatial resolution can cause the high wind speeds on mountains to be averaged out with the low wind speeds in the valleys. It's important to view the map as a guide, rather than an exact measure of your wind speed. In East Tennessee and Kentucky, the wind resource is best at elevations 1500 feet above sea level.

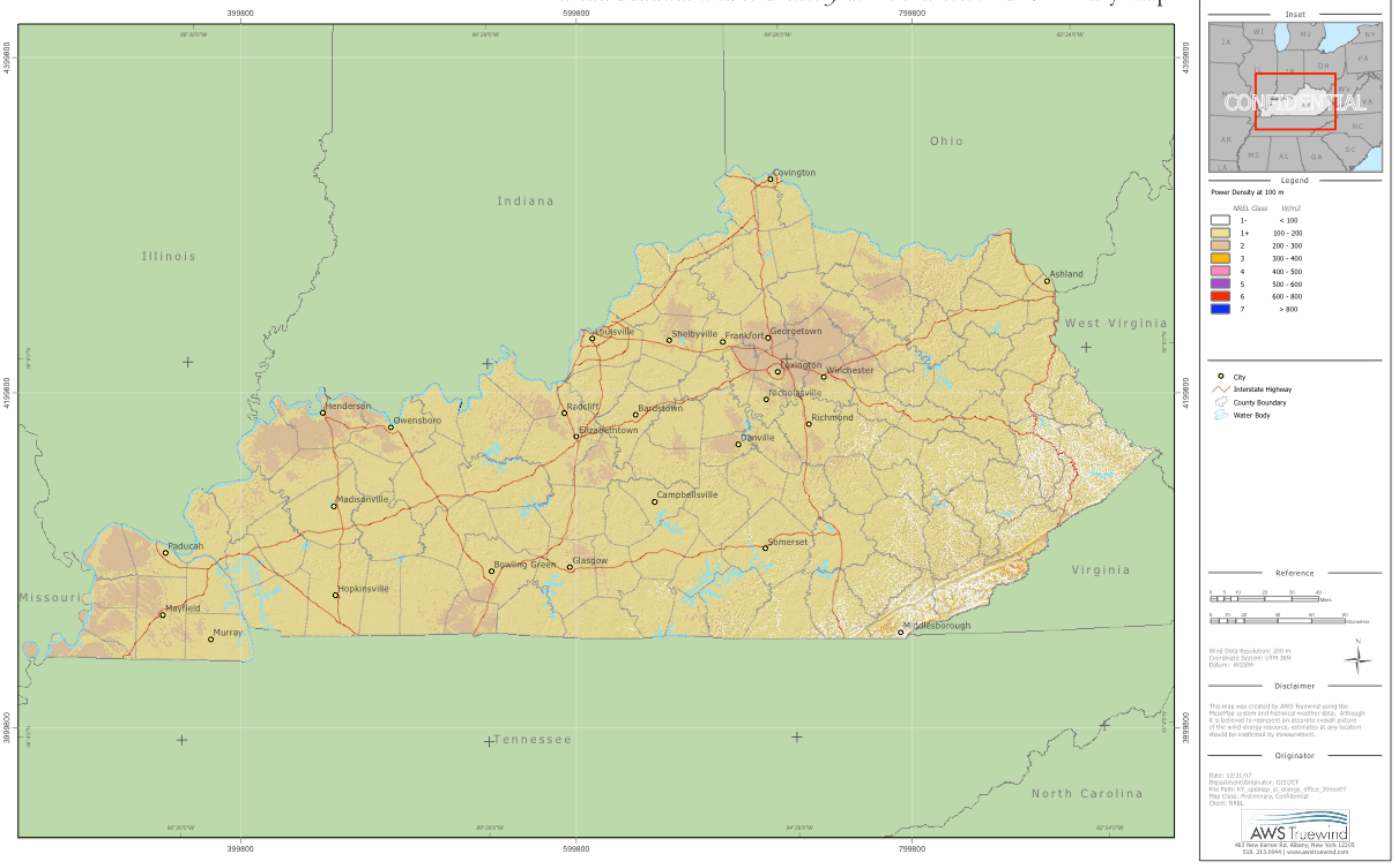
Wind Speed or Power Class: Wind speed maps show average annual wind speeds. Power class maps show power density along with wind speed ranges, classifying wind from 1 through 7. Class 1 indicates low wind speeds and low power density. Extremely high wind speeds and high power density define Class 7.

Height: Specifies the height above land. Wind speed averages will be higher the higher off the ground. Eighty meter (264 ft.) tall towers and greater are used for utility-scale wind. Small wind towers are typically thirty to forty-five meters (98-150 ft.).

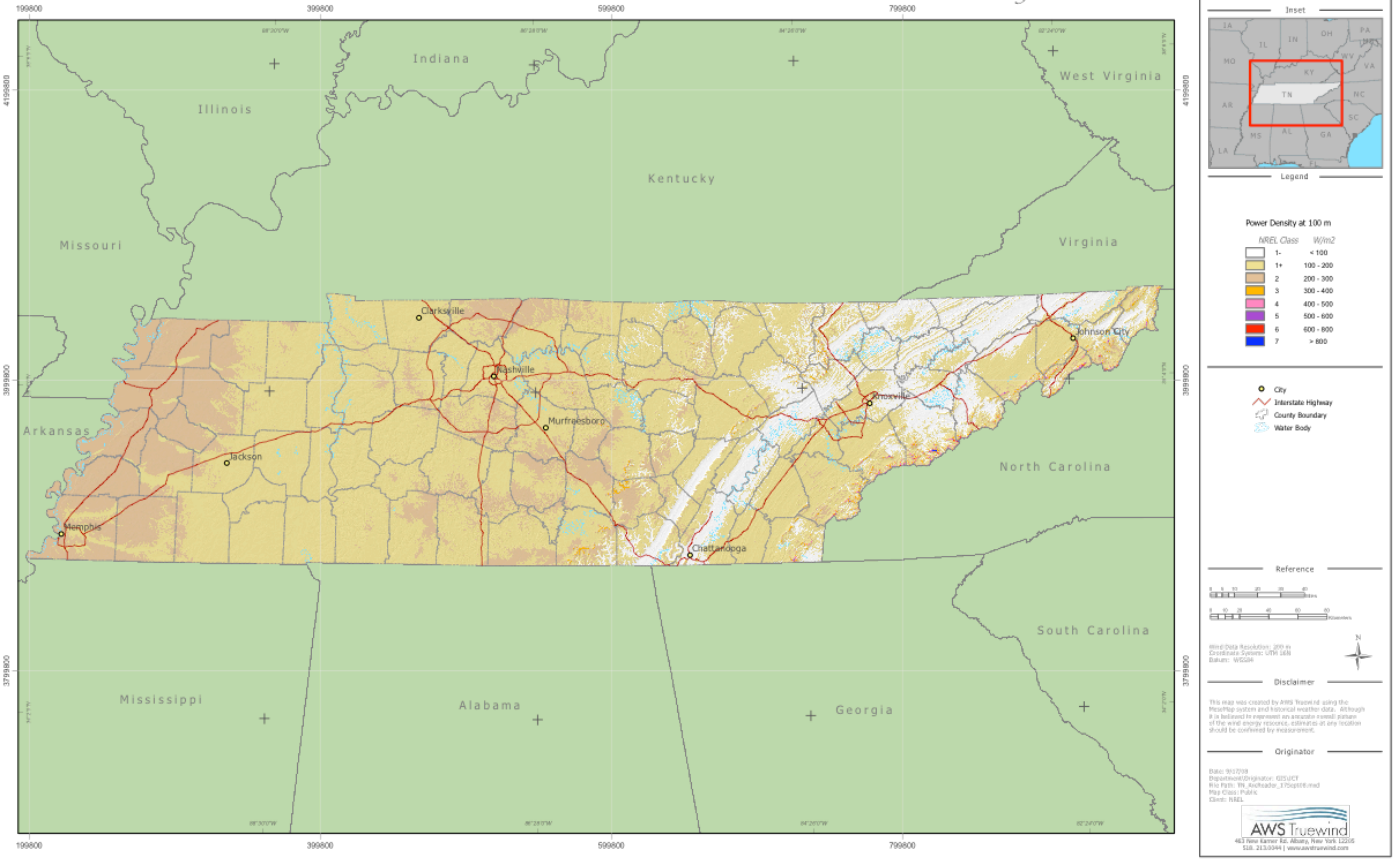

Kentucky - Annual Average Wind Speed at 80 m
89°
88°
87°
86°
85°
84°
83°
82°
39°
38°
37°
Covington
Ashland
Frankfort
Louisville
Lexington
Owensboro
Somerset
Paducah
Hopkinsville
Bowling Green
Middlesboro
Wind Speed m/s
> 10.0
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
< 4.0
Source: Wind resource estimates developed by AWS Truewind, LLC for windNavigator®. Web: http://navigator.awstruewind.com | www.awstruewind.com. Spatial resolution of wind resource data: 2.5 km. Projection: UTM Zone 16 WGS84.
50 0 50 100 150 Kilometers
25 0 25 50 75 100 Miles
AWS Truewind
NREL
National Renewable Energy Laboratory
Innovation for Our Energy Future
19-JAN-2010 2.1.1


Tennessee - Annual Average Wind Speed at 80 m
90°
89°
88°
87°
86°
85°
84°
83°
82°
36°
35°
Clarksville
Kingsport
Bristol
Johnson City
Morristown
Cookeville
Nashville
Dyersburg
Oak Ridge
Knoxville
Murfreesboro
Jackson
Cleveland
Memphis
Chattanooga
Wind Speed m/s
> 10.0
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
< 4.0
Source: Wind resource estimates developed by AWS Truewind, LLC for windNavigator®. Web: http://navigator.awstruewind.com | www.awstruewind.com. Spatial resolution of wind resource data: 2.5 km. Projection: UTM Zone 16 WGS84.
50 0 50 100 150 200 Kilometers
25 0 25 50 75 100 125 Miles
AWS Truewind
NREL
National Renewable Energy Laboratory
Innovation for Our Energy Future
19-JAN-2010 2.1.1

WIND RESOURCE OF KENTUCKY *Mean Annual Power Density at 100 Meters* - Preliminary Map



WIND RESOURCE OF TENNESSEE *Mean Annual Power Density at 100 Meters*



Local Weather Data

You can also check your wind resource by looking at local weather data. Organizations such as the National Oceanic and Atmospheric Administration (www.noaa.gov) and Kentucky Mesonet (www.kymesonet.org) collect wind speed data on meteorological towers. Usually the wind speed data is collected 10 meters above ground, a lower height than we recommend for wind turbines towers.

If there is a meteorological tower near you, at the same elevation, and similar geographically you can estimate the wind speed at the height of your wind tower. Equations are available to extrapolate wind data from one height to another. These "Wind Power Law" equations can be used to get a rough estimate of the wind speed. There is a significant level of uncertainty with these equations since each site is different and trees or buildings obstructing the wind's path can alter wind speed data low to the ground.

$$v_2 = v_1(h_2/h_1)^{\alpha}$$

v_2 = wind speed at height 2 v_1 = wind speed at height 1
h_1 = height 1 h_2 = height 2
α = shear factor. The wind shear factor ranges from 0.143 on smooth ground to 0.25 on rocky, rough terrain.

Anemometer Testing

Anemometers are placed on tall towers to record on-site wind data. Typically, an anemometer tower stays up for at least a year to record wind speed during all four seasons. Typically, winds are strongest during winter, and weakest during summer.

The cost of installing an anemometer tower can be several thousand dollars. For a small turbine under 10 kW capacity, the prices of the turbine itself may not be enough to justify the investment of an anemometer tower. For larger projects, greater than 10 kW, it may be worth the cost of collecting your site's wind speed ahead of time. The wind speed data can be correlated with wind turbine manufacturers' turbine specifications in order to find the best match for the site. The average wind speed of a given site is extremely important in determining how much electricity a turbine will generate and the rate of return.

3. Understand your local policies

Before purchasing any equipment it is important to check with your local power distributor for any interconnection standards or restrictions. To participate in net metering or TVA's Generation Partners program, you must have a contract approved. Some distributers in TVA's service territory do not participate in the Generation Partners power purchase program. A list of participating distributers is available here: http://www.tva.com/greenpowerswitch/partners/distributors.htm

Counties, cities, or neighborhood associations may also have limits to tower heights or require permits.

Federal policies exist for large, utility-scale wind turbines, but as long as your tower is under 200-feet-tall, there are currently no federal policies for small wind turbines.

4. Consider the Turbine and Tower Options Available

Current Pricing

Purchasing a small wind electric system is a long-term investment. The lifetime of an average turbine is 20-25 years. Proper research into your wind resource and the right turbine for your site is important to do in order to recover the initial investment over the life of the turbine. See Chapter 8 for details on financing such as tax credits and grants that can help to reduce system costs.

A reliable small wind electric system and tower in Tennessee and Kentucky will cost, on average, $5000-$8000 per kilowatt capacity installed. Small wind turbines can be less expensive in other parts of the United States with stronger wind energy markets. Another factor adding to the cost of small wind in our states is the need for a taller tower to reach the wind resource.

Generally, larger systems will be less costly per kilowatt. A 2.4kW system, including the tower, inverter, and installation can cost approximately $18,000 ($7500 per kilowatt). A system rated 10kW, will be about $60,000, or $6000 per kilowatt. Costs often include permit and grant writing by the installation company, when applicable.

Tower Options

Prices will depend on the type of tower used: monopole, lattice, or guy-wired. Many small wind turbines use narrow pole towers supported by guy wires. This is an inexpensive option, but it is not easy to climb (for inspections or repairs) and may require more land than self-supporting towers, due to the guy wires.

Lattice towers use welded steel profiles. These towers have three or four leg, and may or may not be guyed, depending on height and the terrain where the tower is being installed. They are usually climbable, which makes turbine maintenance more convenient.

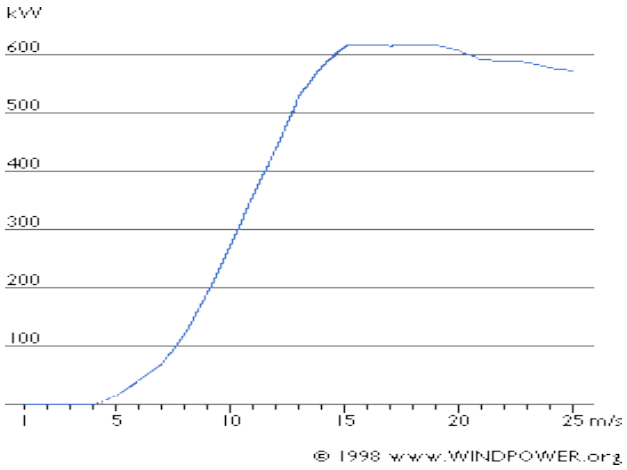
Monopole towers use a self-supporting pipe or tube. These towers can be relatively expensive, but make a generally more attractive installation.

Towers must be strong enough to handle the weight of the wind turbine and additional wind loads. When pairing a turbine with a tower that is not provided by the same manufacturer, it’s recommended to have an engineer confirm the safety of the structure.

How much energy will my system generate?

Each turbine manufacturer should provide a power curve specific to their turbine. A power curve is a graph indicating how much power a wind turbine will produce at any given wind speed. Power is presented on the vertical axis and wind speed on the horizontal axis. This is a "rated" power level and is not used to describe the energy generated over a period of time. Using wind data over a period of time, as long as possible, this chart can help predict the annual energy production with a particular wind turbine.

The following is an example of a power curve for a 600kW capacity wind turbine. The graph shows that when the wind speed is 15 m/s (33.6mph), the turbine will run at full capacity (600kw). When the wind speed is 11 m/s (24.6mph), the turbine will run at half capacity (about 300kW).



Turbines

Turbine manufacturers performance specifications should be taken with a grain of salt. The Small Wind Certification Council (SWCC) was formed recently to address the problem of inconsistency with small turbine ratings and power performance testing. SWCC, an independent certification body, certifies that small wind turbines meet or exceed the requirements of the American Wind Energy Association's *Small Wind Turbine Performance and Safety Standard*.

This certification provides a uniform standard for reporting turbine energy and sound performance, and fosters acceptance of small wind technology.

SWCC started accepting applications for certification in 2010. Once a turbine is certified it will be listed on the SWCC website: www.smallwindcertification.org/.

Horizontal-Axis (HAWTs) versus Vertical-Axis Wind Turbines (VAWT) and Tower-mounted versus Rooftop

Vertical axis wind turbines are not a new or breakthrough technology. They have been tested alongside the many varieties of horizontal axis turbines. The three-blade horizontal axis turbine has been selected by the wind energy market as the most efficient, reliable, and economic way to collect energy from the wind.

Vertical axis and roof-top mounted turbine salesmen will tell you that a tower is not necessary for

their systems. This is simply not the truth. Our states are full of trees, buildings, and landforms that disrupt the flow of wind. The wind low to the ground is turbulent. Wind turbines need to be placed on tall towers to access the smooth wind flow.

For those concerned about birds and wildlife, there are no studies showing that vertical axis small wind turbines are safer for birds than horizontal axis small wind turbines. Harm to birds and bats are mainly a concern for large wind farms. Small wind turbines should not be a threat to birds, especially when they are sited correctly. It is recommended that wind turbines be sited away from wetlands, lakes and ponds where birds often visit.

5. Siting a turbine

Wind turbines should be placed in a clear area, away from power lines. For safety, it is recommended that turbines towers should stand one and a half times the tower height from public roads and neighboring property. For example, a 100-foot tower should sit at least 150 feet from a highway or a neighbor's fence.

For maximum efficiency, the height of a small turbine tower should allow the bottom of the turbine blades to be 30 feet or more above the top of any structure or obstacle, like trees or buildings, within 500 feet of the tower.

To learn more about maximizing your return on your wind system by choosing the correct tower height, read "How Tall is Too Tall" by Brian Raichle & Brent Summerville from Home Power Magazine, August and September 2008 edition: http://homepower.com/view/?file=HP126_pg84_Raichle

Local zoning ordinances or homeowner association rules may impose height restrictions for wind towers. Generation may be limited by a restriction on structure height, such as maximums of 30 or 40 feet, due to certain ordinances or rules. Check with your city and county for local permitting requirements before choosing a tower.

6. Connect to the grid, or not

Most turbine owners will opt to tie their system into the local grid. With a grid-tied system, the turbine owner will not need back-up power if the wind stops blowing – the utility will provide power. Always consult your local utility before purchasing equipment to ensure that your system will meet safety requirements and power quality. You may also be required to sign an agreement with the utility before your system is installed. In order to protect utility line workers during a power outage, electricity from home power systems automatically shuts off so no power feeds into the grid.

Net metering is available for grid-tied systems in Kentucky and most TVA distributors offer a dual-metering program. See Chapter 8 for power purchase policies.

Turbine owners can also opt for an "off the grid" system to power a home or charge batteries. Off-grid systems guarantee the homeowner is only using electricity provided by the wind turbine and

operate without the need for a utility. An off-grid system can supply power even when the utility's power is out because the system is not tied to the grid. However, batteries large enough to store significant amounts of electricity are very expensive and will increase the cost of the system overall.

Whether or not your system is connected to the grid, your system is subject to follow national and local electric code. Codes often require wind systems certified by Underwriters Laboratories (UL). Section 694 of the 2011 National Electric Code is specific to small wind electric systems. Be sure to use certified electricians, regardless of whether your turbine is grid-tied or off-grid.

7. Common questions

Is noise a problem with wind turbines?

Over the past decade, wind turbine noise has been reduced through improved engineering and through appropriate use of setbacks from nearby residences (see Section 5).

Small wind turbines facing "upwind" will be quieter than those facing "downwind". Upwind turbines allow wind to hit the rotor blades first, avoiding a thumping noise heard from downwind turbines, caused by the blades passing behind the tower.

A small amount of noise is generated by the mechanical components of the turbine. Turbine manufacturers should provide a decibel (dBA) rating.

Source/Activity	Indicative noise level dB(A)
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Small Wind turbine at base of tower	35-50
Car traveling 40mph, 100m away	55
Busy general office	60
Truck at 30mph, 100m away	65
Pneumatic drill, 7m away	95
Jet aircraft, 250m away	105
Threshold of pain	140

Information taken from The Scottish Office, Environment Department, Planning Advice Note, PAN 45, Annes A: Wind Power, A.27. Renewable Energy Technologies, August 1994

What is shadow flicker?

When a moving object comes between a viewer and a light source it can cause a flicker effect. This usually only occurs when the sun is positioned at low angles in the mornings or afternoons. Flicker is easily mitigated by properly siting a wind turbine so that the turbine shadow will not fall on an occupied building with windows facing the turbine. Shadow flicker from wind turbines does not cause epilepsy.

8. Wind turbine incentives

Policies and financing options are subject to change. To check for the most up-to-date information, visit the Database of State Incentives Renewables and Efficiency, http://www.dsireusa.org.

Federal Incentives		
Name	Who can apply?	Description
Residential Renewable Energy Tax Credit	Residents	Owners of 100 kW or less capacity small wind systems can receive a credit for 30% of the total installed cost of the system. Systems must be placed in service from January 1, 2008, through December 31, 2016.
Business Energy Investment Tax Credit	Business	For small wind turbines, the credit is equal to 30% of expenditures, with no maximum credit for small wind turbines placed in service after December 31, 2008.
USDA Renewable Energy Systems and Energy Efficiency Improvements Program (REAP) Grant and Loan	Rural small business, agriculture	This program currently funds grants and loan guarantees to agricultural producers and rural small business for assistance with purchasing renewable energy systems and making energy efficiency improvements. This nationally competitive grant covers 25% of the cost of the project (up to $500,000) and can be coupled with a guaranteed loan, which can cover up to 50% of the total project cost. To qualify for these grants the project must be for an agricultural producers or rural small business.
Modified Accelerated Cost-Recovery System (MACRS) + Bonus Depreciation	Commercial, Industrial, Agricultural	Businesses may recover investments in certain property through depreciation deductions. The MACRS establishes a set of class lives for various types of property, ranging from three to 50 years, over which the property may be depreciated. A number of renewable energy technologies are classified as five-year property (26 USC § 168(e)(3)(B)(vi)) under the MACRS, which refers to 26 USC § 48(a)(3)(A), often known as the energy investment tax credit or ITC to define eligible property. Such property currently includes small wind (100 kW or less)

Kentucky State Incentives		
Name	Who can apply?	Description
Kentucky Renewable Energy State Tax Credit (Personal)	Residents	The maximum tax credit allowed per taxpayer is $500 for solar hot water and wind technologies. To be eligible, wind and solar hot water equipment must have a manufacturer's warranty of five years or more. Wind turbines must meet the wind industry consensus standards developed by the American Wind Energy Association (AWEA) and U.S. Department of Energy. Wind turbines must also meet the requirements of article 705 of the NEC, and must be UL-certified.
Kentucky Renewable Energy State Tax Credit (Corporate)	Businesses	Solar and wind technologies have a maximum tax credit $1,000 for multi-family residential rental units or commercial property. To be eligible, wind and solar hot water equipment must have a manufacturer's warranty of five years or more. Wind turbines must meet the wind industry consensus standards developed by the American Wind Energy Association (AWEA) and U.S. Department of Energy. Wind turbines must also meet the requirements of article 705 of the NEC, and must be UL-certified.
Mountain Association for Community Economic Development (MACED) Renewable Energy Loans	Small Businesses, Non-profits, Schools, and Municipalities	MACED offers loans to improve energy efficiency through its Energy Efficient Enterprises program. Commercial loans can be used to purchase a wide-variety of equipment and to pay for energy efficiency upgrades and renewable energy installations. MACED has an energy specialist on staff to provide technical assistance to businesses and/or building contractors. Commercial loans are made throughout MACED's service area, which includes 54 Appalachian counties in Kentucky (as designated by the Appalachian Regional Commission).

Tennessee State Incentives		
Name	Who can apply?	Description
Property Tax Incentive	Commercial, Industrial, Utility	Tennessee House Bill 809, enacted into law in Public Chapter 377, Acts of 2003 and codified under Title 67, Chapter 5, states that wind energy systems operated by public utilities, businesses or industrial facilities shall not be taxed at more than one-third of their total installed cost. This law applies to the initial appraisal and subsequent appraisals of wind energy systems, based on a reduced generation capacity of 2/3 due to intermittent production. Assessors and the comptroller takes the 1/3 capacity factor findings into account when assigning value when the property is appraised or reappraised.
Commercial Energy Efficiency Loan Program	Commercial, Industrial, Nonprofit	Pathway Lending's Energy Efficiency Loan Program provides Tennessee business and non-profit entities with below-market loans for energy efficiency and renewable energy improvements. The shared savings option allows organizations to pay off the loan over a 10-year period with 50% of the money going to renewable energy and energy efficiency projects, while retaining the remaining 50% through energy savings to pay off the loan. The amount of savings achieved monthly through energy use reduction determines the monthly payments for the loan as long as payments do not exceed 10 years.

Kentucky Net Metering and TVA Power Purchase Programs	
Kentucky Net Metering	In April 2008, Kentucky enacted legislation (SB 83) that expanded its net-metering law by requiring utilities to offer net metering to customers that generate electricity with photovoltaic (PV), wind, biomass, biogas or hydroelectric systems up to 30 kilowatts (kW) in capacity.
TVA Green Power Switch Generation Partners Program	The Tennessee Valley Authority (TVA) offers a production-based incentive for solar PV and wind projects to residents through participating power distributors. This program, known as TVA Green Power Switch Generation Partners Program, works by purchasing 100% of all wind power generated by a small wind system, at a rate of $0.03/kWh above the current retail rate of electricity for the duration of 10 years. TVA also includes a $1000 check to those customers who chose to generate their own power. To qualify for the program, a system must be greater than 500 W installed capacity, but may not be greater than 50 kW AC installed capacity. The system must also be connected to the grid with a lockable disconnect and be UL certified.
TVA Mid-Sized Renewable Standard Offer	The Tennessee Valley Authority (TVA) now compliments the small generation Green Power Switch Generation Partners Program by providing incentives for mid-sized renewable energy generators between 50kW and 20MW to enter into long term price contracts. TVA bases the standard offer for customer generators off of a seasonal time-of-day averages chart, which sets base prices for the term of the contract. These prices increase at a rate of 3% per year.. Generation is recorded monthly through metering equipment installed by TVA and paid for by the participant. The Base Price Average throughout the contract term is 5.611 cents/kilowatt-hour (kWh); during the daytime from 6am-midnight, the average annual tariff is 6.145 cents/kWh.

Return of Investment Example

A rural Tennessee small business purchases a 10 kW Bergey Excel-S system and tall tower, reaching a 12 mph annual average wind resource.

Estimated Annual Energy Output (kWh)	15,900*
Total System Cost	$60,000

Financial Incentives	
Federal Tax Credit	$18,000
USDA REAP Grant	$15,000
TVA Generation Partners Program	$1,000
Total Invested Cost:	26,000

*Source: Sagrillo and Woofenden, "Wind Buyer's Guide", Home Power Magazine, Jun-Jul 2011, 52.

Simple Payback				
	Retail Rate of Electricity assuming 3% inflation	Purchase Premium rate (first 10 years) and net metering (after 10 years)	Annual purchase amount	Return of Investment
Year 1	0.10	0.13	$2,067	-$23,933
Year 2	0.10	0.13	$2,115	-$21,818
Year 3	0.11	0.14	$2,164	-$19,654
Year 4	0.11	0.14	$2,214	-$17,440
Year 5	0.11	0.14	$2,267	-$15,173
Year 6	0.12	0.15	$2,320	-$12,853
Year 7	0.12	0.15	$2,376	-$10,478
Year 8	0.12	0.15	$2,432	-$8,045
Year 9	0.13	0.16	$2,491	-$5,554
Year 10	0.13	0.16	$2,552	-$3,002
Year 11	0.13	0.13	$2,137	-$866
Year 12	0.14	0.14	$2,201	$1,335
Year 13	0.14	0.14	$2,267	$3,602
Year 14	0.15	0.15	$2,335	$5,937
Year 15	0.15	0.15	$2,405	$8,342
Year 16	0.16	0.16	$2,477	$10,819
Year 17	0.16	0.16	$2,551	$13,371
Year 18	0.17	0.17	$2,628	$15,999
Year 19	0.17	0.17	$2,707	$18,706
Year 20	0.18	0.18	$2,788	$21,494

This example is a simple estimate. It does not assume or account for an interest-collecting loan or increase in carbon prices, other than average inflation. It does not include maintenance costs or downtime losses or the benefit of MARCS advanced depreciation.

Using the same example, if a resident instead of a business purchased this system, the USDA REAP grant would not be applicable and the payback would not be until Year 18.

9. Maintenance

Just like cars, homes, and anything built to stand through hazardous weather and extreme temperature fluxes, a wind turbine will need routine maintenance. Not properly maintaining your turbine could result in reduced energy production and subsequently lengthen your payback period. Check with your installer to create a maintenance plan.

10. About the Tennessee Valley and Eastern Kentucky Wind Working Group

The Tennessee Valley and Eastern Kentucky Wind Working Group is a Department of Energy funded program that joins Tennessee and Kentucky to a national network of state Wind Working Groups, a part of the U.S. Department of Energy's Wind Powering America (WPA) initiative.

The Tennessee Wind Working Group was co-founded in 2004 by the Tennessee Valley Authority (TVA) and Southern Alliance for Clean Energy (SACE) in partnership with the state of Tennessee. In 2010, the Tennessee Wind Working Group expanded to include Kentucky through a partnership with the Appalachian Regional Commission, East Kentucky Power Cooperative, Kentucky's Department for Energy Development and Independence, SACE, Tennessee's Department of Environment and Conservation, and TVA.

TVEKWWG consists of a strong network of people and organizations working together to provide information to various organizations and stakeholders regarding the responsible development of wind power in the state. Members include representatives from utility interests, state and federal agencies, economic development organizations, non-government organizations, local decision makers, educational institutions, and wind industry representatives.

11. Additional Resources

American Wind Energy Association
http://www.awea.org

Appalachian Small Wind Energy Test Facility
http://wind.appstate.edu

DOE Wind Powering America
http://www.windpoweringamerica.gov

East Kentucky Power Cooperative
http://www.ekpc.coop

Kentucky Department for Energy Development and Independence
http://energy.ky.gov

Kentucky Pollution Prevention Center
http://www.kppc.org

Mountain Association for Community Economic Development
http://www.maced.org

North Carolina Solar Center
http://www.ncsc.ncsu.edu

Small Wind Certification Council
http://www.smallwindcertification.org

Southern Alliance for Clean Energy
http://www.cleanenergy.org

Tennessee Valley and Eastern Kentucky Wind Working Group
http://www.tennesseewind.org
http://www.kentuckywind.org

Tennessee Valley Authority
http://www.tva.gov

Windustry
http://www.windustry.org

Tennessee Valley and Eastern Kentucky Wind Working Group

Southern Alliance for Clean Energy
P.O. Box 1842
Knoxville, TN 37901

http://www.tennesseewind.org

http://www.kentuckywind.org